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10/563,126

01/03/2006

Yasufumi Takahashi

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KUBOVCIK & KUBOVCIK

SUITE 1105

1215 SOUTH CLARK STREET

ARLINGTON, VA 22202

EXAMINER

HODGE, ROBERT W

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

03/10/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/563,126	Applicant(s) TAKAHASHI ET AL.	
	Examiner ROBERT HODGE	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 8-12 is/are pending in the application.
- 4a) Of the above claim(s) 8 and 9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 10-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>12/18/09</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

The reply filed on 12/18/09 is not fully responsive to the prior Office Action because of the following omission(s) or matter(s): the status identifiers for claims 8 and 9 state that the claims are "original" when they should indicate that the claims are "withdrawn", since the claims were withdrawn by applicants' election filed 8/31/09. See 37 CFR 1.111. Since the above-mentioned reply appears to be *bona fide*, applicant is put on notice that in order to advance prosecution a notice of non-compliant amendment is not being sent and claims 8 and 9 are being treated as withdrawn from consideration. However if any future amendment is found to be non-compliant a notice of non-compliant amendment will be sent.

Response to Arguments

Applicant's arguments, see Remarks and translation of Foreign Priority Document, filed 12/18/09, with respect to the rejections using CN 149527 have been fully considered and are persuasive. The rejections using CN 149527 has been withdrawn. Because applicants perfected their foreign priority by the filing of an English translation CN 149527 no longer qualifies as prior art.

Applicant's arguments filed 12/18/09 have been fully considered but they are not persuasive. With regards to the rejections of claims 4 and 10 under 35 U.S.C. 101 and 112 second paragraph applicants' arguments are not commensurate with the scope of the claims. Applicants state that the recitations in claims 4 and 10 relates to

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determining the amounts of positive and negative active material. However there is no recitation in claims 4 or 10 that even remotely quantifies the proportions of the positive and negative active materials. The claims only recite a charge capacity ratio (which is a variable ratio, i.e. changes while the battery is being used) of the electrodes at a prescribed 4.4 V which as recited and explained previously is a use of the battery. If applicants wish to include limitations of the quantified proportions of positive and negative active materials to positively recite structure that further limits the parent claims then applicants should so recite and also show where the amendments are supported by the instant disclosure. But until such time the claim rejections will be maintained.

With regards to Yonekawa, applicants state that Yonekawa is teaching that all of the Zr atoms exist in replaced Co sites. However this is not the case and cannot be the case given the actual chemical balance of the reaction that is taking place. As cited by applicants in paragraph [0032] Yonekawa teaches that "ZrO₂ does not remain in the form separated with the lithium cobalt system multiple oxide". As understood by said disclosure the ZrO₂ is not a separate powder, it is part of the same powder mixture that includes the lithium cobalt multiple oxide and cannot be separated which if it cannot be separated than it is adhered to said lithium cobalt multiple oxide, which reads on the claims as recited. Furthermore looking at the example starting in paragraph [0053] by taking the amounts of chemicals added to the mix and converting their masses to moles present in the reaction and using oxygen as the base since it is common among all of the chemicals either reacted or formed, there is 1.4608 moles of oxygen present to be reacted. Therefore *arguendo* if all of the reaction products are reacted to form the final

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product then there must be 0.73 moles of $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ to balance out the Oxygen atoms. If *arguendo* 0.73 moles of $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ is in fact formed (which is not possible) then that would mean that there is 0.73073 moles of Li, 0.72927 moles of Co and 0.00073 moles of Zr. However none of the above listed mole values can exist because the reaction molecules only contain 0.52 moles of Li, 0.51 moles of Co and 0.0004 moles of Zr. The law of conservation of mass states that the amount of material put into a reaction must equal the amount of material that comes out of the reaction (i.e. materials produced and unreacted), which means that matter cannot be created or lost. Not to mention the carbon atoms which are not accounted for in the lithium multiple oxide, the carbon cannot just disappear. Therefore the reaction in Yonekawa's example clearly cannot convert all of the reaction materials to $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ since there is not enough moles of atoms present to provide a complete conversion and also the fact that the carbon is not accounted for. Therefore it is quite clear that not all of the reaction products including ZrO_2 will be reacted and there will in fact be unreacted ZrO_2 in the final product. It is also quite clear that Yonekawa's final product will inherently have ZrO_2 particles adhered to the lithium cobalt oxide, especially given the fact that Yonekawa is performing the same exact process by mixing a lithium salt with tricobalt tetraoxide and zirconium oxide and firing the mix. Therefore since it is clear that there will in fact be unreacted ZrO_2 particles and Yonekawa teaches the same exact method as recited in the claims the final product of Yonekawa reads on the instant claims as recited and the burden is shifted to applicants to prove in the form of evidence otherwise. "When the PTO shows a sound basis for

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believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not.” In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Therefore, the prima facie case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed product. In re Best, 562 F.2d at 1255, 195 USPQ at 433. See also Titanium Metals Corp. v. Banner, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985).

With regards to the Le reference applicants state that Le cannot read on the average particle diameters as recited in the claims since Le teaches ranges less than 100 nanometers. However looking at the exact wording of Le in paragraph [0036] it states “Suitable particles generally include nanoparticles (less than about 100 nanometers in average diameter)”. First and foremost Le discloses the same endpoint as applicants, which is 100 nm. Furthermore in order for a collection of particles to have an “average diameter” there must be particles present that have a larger diameter than 100 nm in order for the average to be “about 100 nm”. Therefore Le still reads on the claims as recited.

The newly presented claims will be addressed in the grounds of rejection below.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 12/18/09 has been considered by the examiner.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 4 & 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear how “a ratio in charge capacity” at an “end-of-charge voltage of the battery is prescribed at 4.4 V” further limits the structure of the product of the parent claims. Therefore as long as the chemistry of the battery is found in the parent claims it will read on the above listed claims as recited. Said recitations also appear to be reciting only the intended use of the battery.

Claims 4 & 10 provides for the use of a battery, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 4 & 10 are rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper

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definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-6 and 10 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by JP 2002-358963 hereinafter Yonekawa.

Yonekawa teaches a nonaqueous electrolyte secondary battery which has a positive electrode containing lithium cobalt oxide as a positive active material, a negative electrode containing a graphite material and a nonaqueous electrolyte solution containing 10-20% by volume of ethylene carbonate as a solvent and which is charged with an end-of-charge voltage of at least 4.3 V, said battery being characterized in that said positive active material is a product obtained by firing a mixture of a lithium salt, tricobalt tetraoxide (Co_3O_4) and a zirconium compound at a temperature of below 900 °C. but not below 700 °C, such that the zirconium compound is in an amount of less than 1 mole % but not less than 0.1 mole %, based on the total mole of cobalt and zirconium that has a particle diameter from 100 nm to 3 μm , and the zirconium compound adheres onto particle surfaces of said lithium cobalt oxide (paragraphs [0012]-[0014], [0019], [0022], [0024], [0031], [0038], [0042], [0044] and [0052]-[0055]). In paragraph [0032] Yonekawa teaches that “ ZrO_2 does not remain in the form

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separated with the lithium cobalt system multiple oxide". As understood by said disclosure the ZrO_2 is not a separate powder, it is part of the same powder mixture that includes the lithium cobalt multiple oxide and cannot be separated which if it cannot be separated than it is adhered to said lithium cobalt multiple oxide, which reads on the claims as recited. Furthermore looking at the example starting in paragraph [0053] by taking the amounts of chemicals added to the mix and converting their masses to moles present in the reaction and using oxygen as the base since it is common among all of the chemicals either reacted or formed, there is 1.4608 moles of oxygen present to be reacted. Therefore *arguendo* if all of the reaction products are reacted to form the final product then there must be 0.73 moles of $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ to balance out the Oxygen atoms. If *arguendo* 0.73 moles of $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ is in fact formed (which is not possible) then that would mean that there is 0.73073 moles of Li, 0.72927 moles of Co and 0.00073 moles of Zr. However none of the above listed mole values can exist because the reaction molecules only contain 0.52 moles of Li, 0.51 moles of Co and 0.0004 moles of Zr. The law of conservation of mass states that the amount of material put into a reaction must equal the amount of material that comes out of the reaction (i.e. materials produced and unreacted), which means that matter cannot be created or lost. Not to mention the carbon atoms which are not accounted for in the lithium multiple oxide, the carbon cannot just disappear. Therefore the reaction in Yonekawa's example clearly cannot convert all of the reaction materials to $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ since there is not enough moles of atoms present to provide a complete conversion and also the fact that the carbon is not accounted for. Therefore it

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is quite clear that not all of the reaction products including ZrO_2 will be reacted and there will in fact be unreacted ZrO_2 in the final product. It is also quite clear that Yonekawa's final product will inherently have ZrO_2 particles adhered to the lithium cobalt oxide, especially given the fact that Yonekawa is performing the same exact process by mixing a lithium salt with tricobalt tetraoxide and zirconium oxide and firing the mix. Therefore since it is clear that there will in fact be unreacted ZrO_2 particles and Yonekawa teaches the same exact method as recited in the claims the final product of Yonekawa reads on the instant claims as recited and the burden is shifted to applicants to prove in the form of evidence otherwise.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yonekawa as applied to claims 1 and 2 above.

Yonekawa further teaches in paragraph [0053] that the ratio of Zr to Li is rather small (around 0.7%) and given the fact that some of the ZrO_2 will react and some of it won't the amount of ZrO_2 present to adhere to the surface will in fact be reduced which means that there is not enough ZrO_2 present to cover even 1% of the surface of the lithium cobalt oxide that is formed during the reaction. Yonekawa teaches the claimed invention except for expressly stating "at least 80% of the particle surface being left uncovered". It would have been obvious to one having ordinary skill in the art at the

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time the invention was made to optimize the amount of metal oxide particles adhered to the cathode active material particles to be less than 80% since Yonekawa does not teach enough material to cover even 1% of the surface and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See MPEP 2144.05.

Claims 1-4, 6 and 10-12 is rejected under 35 U.S.C. 103(a) as being unpatentable over by U.S. Pre-Grant Publication No. 2004/0121234 hereinafter Le.

With regards to claim 1, Le teaches a nonaqueous electrolyte secondary battery which has a positive electrode containing lithium cobalt oxide as a positive active material, a negative electrode containing a graphite material and a nonaqueous electrolyte solution containing ethylene carbonate as a solvent and which is charged with an end-of-charge voltage of at least 4.3 V, said battery being characterized in that a zirconium-containing compound adheres onto particle surfaces of said lithium cobalt oxide (abstract and paragraphs [0008]-[0009] and [0026]-[0047]).

With regards to claims 2-4, 6 and 10, Le further teaches that the zirconium compound is in an amount of less than 1 mole % but not less than 0.1 mole %, based on the total mole of cobalt and zirconium that has a particle diameter from 100 nm to 3 μm (see citations above).

With regards to claims 11 and 12, Le teaches in paragraph [0042] that the metal oxide particles are adsorbed on the surface of the cathode active material (i.e. does not exist as a film or shell covering the core of the active material) and that the surface is preferably partially covered with the metal oxide particles without affecting the transport

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of lithium to and from the active particles. Le teaches the claimed invention except for expressly stating “at least 80% of the particle surface being left uncovered”. It would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the amount of metal oxide particles adhered to the cathode active material particles in order to prevent a film or shell from forming which would prevent the transport of lithium to and from the active particles and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See MPEP 2144.05.

The examiner notes that claims 2-4, 6, 7, 10 and 12 are product-by-process claims. “Product-by-process claims are not limited to the manipulations of the recited steps, only the structure implied by the steps”. See MPEP § 2113. Therefore because all of the structure recited in claims 2-4, 6, 7 and 10 is present in the Le reference, claims 2-4, 6, 7 and 10 are included in the above 102(a/e)/103(a) rejection.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Le as applied to claim 2 above, and further in view of U.S. Patent No. 5,030,528 hereinafter Shen.

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Le does not teach the amount of ethylene carbonate present in the electrolyte solution.

Shen teaches a lithium secondary battery wherein the nonaqueous solvent mixture comprises 10-20% by volume of ethylene carbonate (abstract and column 2, line 62 - column 3, line 4).

At the time of the invention it would have been obvious to one having ordinary skill in the art to regulate the amount of ethylene carbonate present in the electrolyte solution such that it is between 10-20% by volume in Le as taught by Shen in order to provide a lithium secondary battery having an improved electrolyte that will have lower internal impedance, longer cycle life, higher energy density, low self-discharge and a longer shelf life (abstract of Shen). If a technique has been used to improve one device (regulating the amount of ethylene carbonate present in the electrolyte solution such that it is between 10-20% by volume), and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way (providing a lithium secondary battery having an improved electrolyte that will have lower internal impedance, longer cycle life, higher energy density, low self-discharge and a longer shelf life (abstract of Shen)), using the technique is obvious unless its actual application is beyond his or her skill. See MPEP 2141 (III) Rationale C, KSR v. Teleflex (Supreme Court 2007).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **ROBERT HODGE** whose telephone number is (571)272-2097. The examiner can normally be reached on 8:00am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on (571) 272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert Hodge/
Primary Examiner, Art Unit 1795